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BRIEF INTRODUCTION TO THE LABORATORY OF LASER SPECTROSCOPY AT THE ANHUI INSTITUTE OF OPTICS AND FINE MECHANICS, CHINESE ACADEMY OF SCIENCES

by

Wu Cunkai

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By: Wu Cunkai

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Brief Introduction to the Laboratory of Laser Spectroscopy at the Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

Author: Wu Cunkai

(Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences)

1. Research Orientations of the Laboratory

With the development and day-by-day maturation of laser technology, laser spectroscopy has achieved rapid development over the last several years. For the past several years, many significant achievements have been made in the fields of basic research and applied research, and many new laser spectroscopy methods have been created. Major progress has been made in the fields of isotope separation, monatomic and monomolecular detection, atomic and molecular energy level structures and properties, synthesis of new materials, frequency standards, molecular biology, biological information, early tumor diagnosis, and other areas.

The major research orientations of the Laboratory of Laser Spectroscopy at the Anhui Institute of Optics and Fine Mechanics [AIOFM], Chinese Academy of Sciences, are: the employment of new laser spectroscopy technology and its high spectral resolution, high time resolution, high sensitivity, and high accuracy; selection of working material systems with major significance for the development of the national economy, defense, and all academic fields;

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and implementation of systematic, in-depth research on atomic and molecular excitation state dynamic processes.

2. Primary Research Contents and Top-Priority Tasks Supported by the Laboratory

Primary research contents: high excitation state spectra of atoms and molecules, atomic and molecular isotope spectra, quasi-molecular and van der Waals molecular spectra, free radical and transient particle spectra, biological and organic molecular spectra, and so on.

The top-priority research items the laboratory has supported during the last three years are:

Basic research areas:

(1) Deposits of laser energy in atoms and molecules, their processes of transference, and excitation state dynamics;

(2) Process dynamics of atomic and molecular ionization and molecular dissociation;

(3) Van der Waals molecules and transient particle spectra;

(4) Biological molecular spectra;

(5) Molecular and solid spectrum theory and molecular energy transfer theory.

Applied basic research areas:

(1) Methods of laser spectroscopic [detection] of geological mineral resources;

(2) Methods of laser spectroscopy for environmental testing;

(3) Function process dynamics of pharmaceuticals;

(4) Dynamic properties of high-purity laser composite materials.

3. Present Situation of the Laboratory

The Laboratory of Laser Spectroscopy at the Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, was established in 1980. In order to let research work rapidly catch up to advanced international levels, the method of joint research with the Quantum

Optics Research Academy at the Max Planck Institute in West Germany was adopted. For one thing, the laboratory has imported complete sets of advanced testing instruments and cross-molecular beam devices from abroad and, for another, it has sent many young and middle-aged research fellows abroad for advanced studies. The laboratory has begun to set up advanced experimental devices and testing equipment for carrying out laser spectroscopy research and has cultivated a group of key scientific researchers with impressive skills.

At present, four spectroscopy laboratories have been established:

1. Cross Molecular Beam Spectroscopy Laboratory:

This laboratory has an imported molecular beam device with a complementary measurement system. It uses continuous-wave tunable narrow-spectrum-width laser radiation as a light source, and employs diffusion cross molecular beams, laser induction fluorescence methods and chemical luminescence methods to study molecular spectra and elementary reaction dynamics. There are a refrigerated photoelectric multiplier tube, a photon counter and optical multichannel analyzer, and a microcomputer in the signal receiving device.

2. Molecular Beam Multi-photon Ionization Laboratory:

This laboratory makes use of pulsed laser light sources and utilizes molecular beam devices, quadrupole mass spectrographs and flight time spectrographs to study the multi-photon processes of atoms and molecules. Laser mass spectra, monatomic and monomolecular detection, and multi-photon laser spectroscopy [are studied as well].

3. Molecular Internal Energy Transfer Laboratory:

The distinguishing feature of this laboratory is its advanced international-level small-signal processing system. This measuring system can extract signals that are 30 times smaller than the noise. By taking multiple averages, the signal-to-noise ratio can be raised from the original 1:30 to 10:1. A near-infrared tunable optical parameter laser, a selective[1] CO_2 laser, and a complete microcomputer system that can automatically process experimental data in real time are provided to support this advanced equipment. [This system] can simultaneously process and store

[1] Most likely translation for "*xuan*^{3}*zhi*^{1}."

spectrum signal data.

4. Biological Molecular Spectrum Laboratory:

This laboratory uses pulsed (nanosecond and picosecond) tunable laser radiation to study the nonlinear laser spectra of biological molecules.

The overall condition of the facilities at this laboratory is, as Chinese experts in the same field who evaluated this laboratory said, "As far as experimental facilities are concerned, the light and materials reaction chamber and signal detector provide a good foundation at present. In contrast, the laser light source is a weak link, and [the laboratory] should gradually acquire a set of lasers that perform well."

We welcome science workers from China and abroad who are engaged in laser spectroscopy research relevant to these laboratories to come and work here, in order to raise China's laser spectroscopy research levels, cultivate qualified personnel, promote academic exchanges and interdisciplinary crossover, and make contributions to the development of China's national economy.